

### REMARKS

Claims 1 through 25 are pending in this application. Claims 1, 2, 6, 7, 11, 14-15, 19-20, and 25 have been amended as indicated above.

#### The Restriction Requirement

Applicant notes with appreciation the withdrawal of the restriction requirement and the examination of all pending claims.

#### Claims Objections

The Office has objected to claims 1 and 6 because claim 1 (and presumably claim 6) recites that the limitation of “the second of surface of the ceramic layer” with sufficient [sic] antecedent basis. Applicant appreciates the Office’s notation of this oversight of lack of proper antecedent basis in these two claims. Accordingly, Applicant has amended claim 1 and claim 6 to correct this oversight.

#### Claim Rejection: 35 USC § 112

The Office has rejected claims 11-15 and 19-25 under 35 USC § 112, second paragraph, as being indefinite for the reasons noted on pages 2-3 of the Office Action. Applicant respectively traverses this rejection.

The Office argues that the rejected claims are indefinite because the Figures do not disclose the limitation of a molding material which encapsulates a portion of the second surface of the ceramic layer. As the Office is aware, the claims are considered in light of the entire

specification, and not merely the Figures. Thus, the proper inquiry is whether the Figures and the specification combined describe this limitation. According, rejecting the claims merely because the Figures allegedly do not disclose this limitation is improper.

Nevertheless, in an effort solely to expedite prosecution, Applicant has amended the claims as indicated above to provide more consistency between the rejected claims and the other pending claims. Accordingly, Applicant respectfully requests withdrawal of this rejection.

Claim Rejection: 35 USC § 102 over Heinen et al.

The Office has rejected claims 6-8 and 14 under 35 USC § 102(b) as being anticipated by Heinen et al. (U.S. Patent No. 5422788) for the reasons noted on pages 3-4. Applicant respectfully traverses this rejection.

Pointing to Figure 1 and its accompanying description, the Office argues that Heinen et al. teach every limitation in the claims. Applicant respectfully disagrees. The rejected claims currently contain the limitation that a ceramic layer is directly attached to the lead frame via an epoxy. But the Office has not substantiated that device in Figure 1 of Heinen et al. describes such a limitation.

To begin with, the Office has not shown that the device in Figure 1 of Heinen et al. teach a ceramic layer. The Office argues that the device of Figure 1 contains a heat sink 15 that is ceramic, citing to column 1, lines 31-32. This section of column 1 discloses that the heat sinks of conventional devices can be metal or ceramic. Even knowing that both can be used, Heinen et al. still describes that the heat sink 15 in Figure 1 is a heat spreader (or heat sink) that preferably is a metal heat spreader, for example, copper. *See column 1, lines 59-61.* When describing Figure 1, there is no mention that the heat spreader is ceramic.

Further, the Office has not shown that Heinen et al. describe that the heat sink 15 is directly attached to the lead frame via an epoxy. The device of Figure 1 contains adhesive 17 and coating 23 that are located between heat sink 15 and the chip support pad 13. The coating 23 is used to enhance the adhesion between the molding compound 19 and the heat sink 15. *See column 3, lines 3-22.* The coating can be a conductive layer (like nickel aluminide) and its adhesion strength can be retained even during the processing for making the device of Figure 1, including a reflow soldering process. *See column 3, lines 23-37.* But the claimed invention directly attaches the ceramic layer to the lead frame using epoxy and without using a conductive layer pattern because of the problems created using a soldering process. *See paragraphs [007] and [0033].*

Thus, the Office has not shown that Heinen et al. teach every limitation recited in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

Claim Rejection: 35 USC § 102 over Boon et al.

The Office has rejected claims 1-3 and 5 under 35 USC § 102(e) as being anticipated by Boon et al. (U.S. Patent No. 6380048) for the reasons noted on pages 4-5. Applicant respectfully traverses this rejection.

Pointing to Figure 4b and its accompanying description, the Office argues that Boon et al. teach every limitation in the claims. Applicant respectfully disagrees. The rejected claims contain the limitation that a molding material encapsulates the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface. But the Office has not substantiated that the device of Figure 4b of Boon et al. contains such a feature.

To begin with, the Office has not shown that the device in Figure 1 of Boon et al. contains a ceramic layer. The Office argues that the device of Figure 4b contains a ceramic layer 10, citing to column 10, lines 32. The description accompanying Figure 4b, however, describes layer 10 as a heat sink 10 that has a surface that is electrically conductive. *See column 7, lines 31-32.* The lines in column 10 cited by the Office describe a different device that is depicted in Figure 8c. When discussing the Figure 8c device in column 10, Boon et al. describe that other types of materials can be used for the heat sink. But Boon et al. do not describe that other types of materials can be used for the heat sink in Figure 4b.

Further, the Office has not shown that Boon et al. describe encapsulation of the ceramic layer except for the second surface of that layer. The device in Figure 4b contains molding 74 that provides encapsulation for the device. But the Office has not shown that the molding 74 of Boon et al. encapsulates the heat sink 10 except for the second surface (that surface away from the chip 66). Indeed, based on Figure 4b, the skilled artisan would understand that the molding only encapsulates a portion of the first surface of the heat sink 10, and does not encapsulate the “sides” of the heat sink 10.

Thus, the Office has not shown that Boon et al. teach every limitation recited in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

Claim Rejection: 35 USC § 103 over Boon et al. & Nakanishi

The Office has rejected claim 4 as being unpatentable over Boon et al. in view of Nakanishi et al. (U.S. Patent No. 6501156) for the reasons noted on page 6. Applicant respectfully traverses this rejection.

As noted above, the Office has not substantiated that the device in Figure 4b of Boon et al. teaches or suggests the limitation that a molding material encapsulates the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface. Neither has the Office shown that the skilled artisan would have considered such a limitation taught or suggested by the disclosure of Nakanishi et al. And since neither reference individually teaches or suggests this limitation, the combination of these references can not suggest this limitation.

Thus, the Office has not shown that the combination of the cited references suggests every limitation recited in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

Claim Rejection: 35 USC § 103 over Heinen et al. & Nakanishi

The Office has rejected claim 9 as being unpatentable over Heinen et al. in view of Nakanishi et al. for the reasons noted on pages 6-7. Applicant respectfully traverses this rejection.

As noted above, the Office has not substantiated that the device in Figure 1 of Heinen et al. teaches or suggests the limitation that a ceramic layer is directly attached to the lead frame via an epoxy. Neither has the Office shown that the skilled artisan would have considered such a limitation taught or suggested by the disclosure of Nakanishi et al. And since neither reference individually teaches or suggests this limitation, the combination of these references can not suggest this limitation.

Thus, the Office has not shown that the combination of the cited references suggest every limitation recited in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

Claim Rejection: 35 USC § 103 over Heinen et al. & Boon et al.

The Office has rejected claims 10-13 and 15-24 as being unpatentable under 35 U.S.C. § 103 over Heinen et al. in view of Boon et al. for the reasons noted on pages 7-10. Applicant respectfully traverses this rejection.

As noted above, the Office has not substantiated that the device in Figure 1 of Heinen et al. teaches or suggests the limitation that a ceramic layer is directly attached to the lead frame via an epoxy. Neither has the Office shown that the skilled artisan would have considered such a limitation taught or suggested by the disclosure of Boon et al. Further, the Office has not substantiated that the device in Figure 4b of Boon et al. teaches or suggests the limitation that a molding material encapsulates the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface. Neither has the Office shown that the skilled artisan would have considered such a limitation taught or suggested by the disclosure of Heinen et al. And since neither reference individually teaches or suggests these limitations, the combination of these references can not suggest them.

The Office admits that the device in Figure 1 of Heinen et al. fails to teach that a ceramic layer is directly attached to the second surface of the lead frame and that the first surface of the ceramic layer does not contain a conductive layer. The Office contends that Boon et al. teach such limitations and that it would have been obvious for the skilled artisan to have incorporated the teachings of Boon et al. in the device of Heinen et al. to have the heat sink directly attached to

the lead frame pad and eliminate the conductive layer to reduce the package size and to prevent unnecessary noise between the ceramic and the lead frame. Applicant disagrees that the skilled artisan would have considered this proposed combination obvious.

Heinen et al. describe that because of the thermal mismatch between the heat sink 15 and the molding compound 19, a thin film coating 23 (such as nickel aluminide) is applied to the heat sink 15 and is therefore located between the heat sink 15 and the chip support pad 13 as shown in Figure 1. The thin film coating serves to enhance the adhesion of the molding compound 19 to the heat sink 15. *See column 3, lines 3-22.*

To modify Heinen et al. as proposed by the Office would create a direct contact between the chip support pad 13 and the heat sink 15, and to eliminate any conductive layer. This proposed modification would require eliminating the coating 23 from between these two components. But such a modification would remove coating 23 which Heinen et al. expressly described as being needed to enhance adhesion. Thus, removing the coating 23 would render Heinen et al. unsuitable for its intended purpose of having the coating 23 present to enhance adhesion. In such instances, no motivation exists for the skilled artisan to make the proposed modification. *See M.P.E.P. 2143.01.*

Thus, the Office has not shown that the combination of the cited references suggests every limitation recited in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

Claim Rejection: 35 USC § 103 over Heinen et al., Boon et al., & Moline

The Office has rejected claim 25 as being unpatentable over Heinen et al. and Boon et al. in view of Moline (U.S. Patent No. 5075759) for the reasons noted on pages 11-12. Applicant respectfully traverses this rejection.

As noted above, the Office has not substantiated that a proper combination of Heinen et al. and Boon et al. teach or suggest the limitations (1) of a ceramic layer that is directly attached to the lead frame via an epoxy or (2) a molding material that encapsulates the lead frame, the semiconductor chip, a portion of the lead, and the ceramic layer except for the second surface. Neither has the Office shown that the skilled artisan would have considered these limitations taught or suggested by the disclosure of Moline. And since none of the references individually teach or suggest these limitations, the combination of these references can not suggest them.

The Office admits that the device of Heinen et al. fails to teach that the first surface of the ceramic layer does not contain a conductive layer. The Office contends that Boon et al. teach such a limitation and that it would have been obvious for the skilled artisan to have incorporated the teachings of Boon et al. in the device of Heinen et al. to remove the conductive layer to prevent unnecessary noise between the ceramic and the lead frame. As noted above, the Office's proposed combination of Boon et al. and Heinen et al. would not have been obvious to the skilled artisan. Neither has the Office shown that the skilled artisan would have considered such a limitation taught or suggested by the disclosure of Moline. And since none of the references individually teach or suggest these limitations, the combination of these references can not suggest them.



Thus, the Office has not shown that the combination of the cited references suggest every limitation recited in the rejected claims. Accordingly, Applicant requests withdrawal of this ground of rejection.

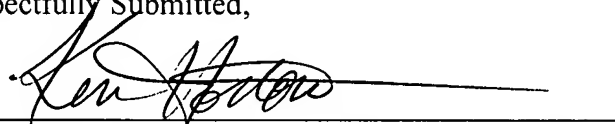
CONCLUSION

For the above reasons, as well as those of record, Applicant respectfully requests the Office to withdraw the pending grounds of rejection and allow the pending claims.

If there is any fee due in connection with the filing of this Amendment, including a fee for any extension of time not accounted for above, please charge the fee to our Deposit Account No. 50-0843.

Respectfully Submitted,

By



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